Practitioner's Docket No. 00265

CHAPTER II

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P., § 601, 7th ed.

TRANSMITTAL LETTER TO THE UNITED STATES ELECTED OFFICE (EO/US)

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/US99/16650	July 22, 1999	July 24, 1998

TITLE OF INVENTION
METHOD AND COMPOSITIONS FOR MANUFACTURING COATED PHOTOCHROMATIC ARTICLES

APPLICANT(S)
Duane L. Wires

Box PCT
Assistant Commissioner for Patents
Washington D.C. 20231

ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. § 1.10*
*(Express Mail label number is **mandatory**.)*
(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date 12/28/00, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EL695201148US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Sheryl A. O'Connor
(type or print name of person mailing paper)

Sheryl O'Connor
Signature of person mailing paper

***WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

***WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

WARNING: *Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.*

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:

a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).

b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
☐*	TOTAL CLAIMS	26 −20=	6	× $18.00=	$ 108.00
	INDEPENDENT CLAIMS	8 −3=	5	× $80.00=	400.00
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $270.00	
BASIC FEE**	☒ U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: ☒ and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) ..... $100.00 ☐ and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) ..... $690.00 ☐ U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: ☐ has been paid (37 C.F.R. § 1.492(a)(2)) ..... $710.00 ☐ has not been paid (37 C.F.R. § 1.492(a)(3)) ..... $1000.00 ☐ where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) $860.00				100.00
	Total of above Calculations				= 608.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 C.F.R. § 1.9, 1.27, 1.28)				− 304.00
	Subtotal				304.00
	Total National Fee				$ 304.00
	Fee for recording the enclosed assignment document $40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				$ 304.00

*See attached Preliminary Amendment Reducing the Number of Claims

XX Attached is a XX check ☐ money order in the amount of $ 304.00

XX Authorization is hereby made to charge the amount of $ any fee deficiencies

XX to Deposit Account No. 15-0825

☐ to Credit card as shown on the attached credit card information authorization form PTO-2038.

WARNING: *Credit card information should **not** be included on this form as it may become public.*

XX Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

A duplicate of this paper is attached.

****WARNING:*** *"To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).*

WARNING: *If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.*

3. XX A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below

a. ☐ is transmitted herewith.

b. XX is not required, as the application was filed with the United States Receiving Office.

c. ☐ has been transmitted

i. ☐ by the International Bureau.
Date of mailing of the application (from form PCT/1B/308):
_____.

ii. ☐ by applicant on _____. *(Date)*

4. [X] A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

a. ☐ is transmitted herewith.

b. XX is not required as the application was filed in English.

c. ☐ was previously transmitted by applicant on _____. *(Date)*

d. ☐ will follow.

5. ☐ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

a. ☐ are transmitted herewith.

b. ☐ have been transmitted

i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308):
_____.

ii. ☐ by applicant on _____. *(Date)*

c. ☐ have not been transmitted as

i. ☐ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.):
_____.

ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☐ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

a. ☐ is transmitted herewith.

b. ☐ is not required as the amendments were made in the English language.

c. ☐ has not been transmitted for reasons indicated at point 5(c) above.

7. ☒ A copy of the international examination report (PCT/IPEA/409)

☐ is transmitted herewith.

☒ is not required as the application was filed with the United States Receiving Office.

8. ☒ Annex(es) to the international preliminary examination report

a. ☐ is/are transmitted herewith.

b. ☒ is/are not required as the application was filed with the United States Receiving Office.

9. ☒ A translation of the annexes to the international preliminary examination report

a. ☐ is transmitted herewith.

b. ☒ is not required as the annexes are in the English language.

10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

a. ☐ was previously submitted by applicant on _____.
Date

b. ☐ is submitted herewith, and such oath or declaration

i. ☐ is attached to the application.

ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.

c. ☒ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

a. ☐ is transmitted herewith.

b. ☐ has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): _____.

c. ☒ is not required, as the application was searched by the United States International Searching Authority.

d. ☐ will be transmitted promptly upon request.

e. ☐ has been submitted by applicant on _____.
Date

12. ☒ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

a. ☐ is transmitted herewith.

Also transmitted herewith is/are:

☐ Form PTO-1449 (PTO/SB/08A and 08B).

☐ Copies of citations listed.

b. ☒ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).

c. ☐ was previously submitted by applicant on _____.
Date

13. ☐ An assignment document is transmitted herewith for recording.

A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

_____

_____

_____

14. ☐ Additional documents:

a. ☐ Copy of request (PCT/RO/101)

b. ☐ International Publication No. _____

i. ☐ Specification, claims and drawing

ii. ☐ Front page only

c. ☐ Preliminary amendment (37 C.F.R. § 1.121)

d. ☐ Other

_____

_____

_____

15. ☒ The above checked items are being transmitted

a. ☒ before 30 months from any claimed priority date.

b. ☐ after 30 months.

16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

_____

_____

_____

_____

_____

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: *Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.*

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ Please charge, in the manner authorized above, the following additional fees that may be required by this paper and during the entire pendency of this application:

☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: *Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.*

09/720754
528 Rec'd PCT/PTO 28 DEC 2000

☒ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid at filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

☒ 37 C.F.R. § 1.17 (application processing fees)

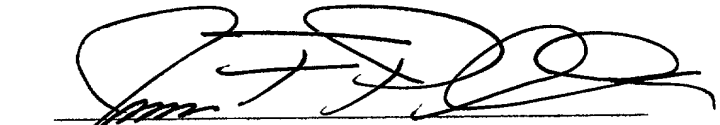
☒ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

☒ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).



SIGNATURE OF PRACTITIONER

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DESCRIPTION

METHOD AND COMPOSITIONS FOR MANUFACTURING COATED PHOTOCHROMATIC ARTICLES

Related Applications

The present application is related to Provisional Applications Serial Nos. 60/094,138 filed July 24, 1998; 60/104,097 filed October 13, 1998 and 60/121,796 filed February 26, 1999.

Technical Field

This invention relates, in part, to the molding of plastic optical lenses, and in particular to the molding of plastic ophthalmic lens. This invention also relates to the use of photochromatic enamel material that can be used to coat various substrates such as plastic optical lenses, optical frames and fingernails.

Background of the Invention

Many techniques have been developed for molding plastic lenses. Generally these techniques involve arranging two circular lens molds, known as half molds, in close alignment to form a casting cavity or opening between the two half molds. The half molds are generally made of glass and have inner surfaces which provide the desired curvature on a finished lens. A liquid resin material is inserted in the cavity and cured. Typically, the curing takes place through use of a catalyst by raising the temperature of the resin or by exposing the resin to ultraviolet light and then cooling the resin. One known polymer which has been used is a polyethylene glycol diallylcarbonate with the addition of a catalyst, for example, isopropyl percarbonate, and sold under the trademark CR39. However, the CR39 polymer when exposed to the curing process of

exposure to elevated temperatures, has an undesirable shrinkage, sometimes approximately about 14%. The shrinkage causes the resin to pull away from the mold halves which allows air to enter the cavity causing damage to the lens. In certain techniques the half molds are held close alignment with a gasket. In the techniques where light is used to cure the resin, the gasket tends to block the light from curing the resin. In techniques where heat is used to cure the resin, the gasket tends to shrink during cure causing leaking of the resin or deformation of the lens being cast.

An additional drawback is that the CR39 type resins tend to take a long time, typically three hours to seventeen hours to cure. This lengthy curing time adds to the costs and time of preparation of the cast lens.

Plastic photochromatic lenses have been available in some form since the early 1980's. However, the early designs were of poor quality, and thus, have not been well accepted by the public. One type of photochromatic lens which enjoys the largest market share of photochromatic lens sales involves taking premanufactured lenses and, under pressure, injecting the photochromatic dye into the lens surface. The process allows any lens manufacturer to send lenses to the color processing company and have the lenses converted into a photochromatic lens.

In the past, monomer and dye heat cured lens processes have been unsuccessful. Photochromatic dyes by their nature become unstable when exposed to the high temperatures required to cure lenses. The dyes also tend to react with the organic peroxides used to cure lenses, creating poor quality or non-changing lenses.

In addition, in certain applications, it is desired that the lenses and other substrates, have the capability to change color. Therefore, there is a need for a photochromatic coating material that can be readily

applied to a suitable substrate to allow the substrate to change color when exposed to different wavelengths of light.

The present invention is also directed to methods and compositions for coating substrates with photochromatic coating materials which are easier to make and use than prior art coating compositions and which more quickly cure than prior art compositions.

Therefore, there is a need to develop an improved method of molding lenses which does not have these problems.

Therefore, there is also a need in the lens making business for a process to prepare lenses for eye glasses which can be quickly and inexpensively manufactured.

There is a further need for a method for making lenses which can be quickly produced without causing cracking of the plastic lens, optical distortions in the lens, or discoloration of the lens.

Further, there is a further need in the lens making business for a process where the lens and the lens making materials do not undesirably shrink or prematurely separate from the mold prior to curing.

There is also a need in the lens making business for a process to prepare lenses for eye glasses which can be quickly and inexpensively colored or tinted to a customer's desired shade.

The present invention is directed to methods, apparatuses and compositions for making plastic lenses that overcome the above discussed disadvantages and drawbacks in the prior art.

Summary of the Invention

The present invention provides methods, apparatuses and compositions for making plastic lenses and, in particular, for optical lenses for eye glasses.

The present invention is useful in casting prescription spheric and aspheric single vision, bifocal and progressive lenses. The present

invention is also useful in casting photochromatic lenses which can be made in a multitude of shades and colors. The present invention can be practiced by the user in an office setting, which reduces costs and time of lens preparation, while allowing the user to have greater control of the lens manufacturing process.

The method of the present invention allows the user to produce thinner lenses with less peripheral distortion since lenses with an index of refraction of 1.70 can be produced. According to the method of the present invention for making plastic lenses, a UV sensitive polymerizable lens forming material is dispensed into a mold cavity. In embodiments where a photochromatic lens is desired at least one suitable photochromatic dye is added to the UV sensitive polymerizable lens forming material and mixed together prior to dispensing the lens forming material into the mold cavity.

The mold cavity is defined between a first, or front, mold member and a second, or back, mold member. The front mold and the back mold are held in a predetermined spaced apart relationship from each other by a gasket. The gasket has a desired plurality of inner edges or lips which removably seal the mold members to the gasket. A very rapidly polymerizable material is dispensed between the mold members.

The polymerizable lens forming material is exposed to diffused ultraviolet light for a short period of time from about two to about four minutes. Preferably the polymerizable lens forming material is exposed to ultraviolet light for about three minutes.

The front mold has a reflective inner surface to reflect UV light after the UV light passes through the polymerizable lens forming material. The reflective inner surface of the front mold allows more light energy to be directed to the polymerizing lens forming material which, in turn allows the polymerizing material to cure more quickly. The reflective inner surface of the front mold illuminates the entire resin material,

thereby eliminating any shadow problems which occur in the prior art lens casting processes. In the prior art lens casting processes where front and back transparent molds are used, shadows are created. In the prior art lens casting processes, the shadows form defects in the polymerizing plastic due to the refraction of the UV light as it passes through a first transparent mold, the polymer material and then a second transparent mold.

In a preferred embodiment of the present invention, the UV light is diffused before it contacts the polymerizing material. The diffused UV light provides a uniform intensity of light exposure to the polymerizable lens forming material. In a preferred embodiment, the mold members are rotated during exposure to the diffused UV light to further the uniformity of light energy and the exposure of the polymerizable lens forming material to the UV light.

In a preferred embodiment, the back mold comprises a glass or other UV transparent material and the front mold comprises a reflective material which has a hard, non UV light absorptive surface. In a preferred embodiment, the front mold comprises a material such as a glass or mirror coated material, nickel or stainless steel material which may be coated with a hard scratch resistant material. In an especially preferred embodiment, a nickel mold is electroplated with a carbon surface that produces a hard diamond like surface on the mold. The hard smooth surface of the front mold allows the cast lens to be readily removed after the lens is cured.

In a preferred embodiment, the gasket is made of a ultraviolet transparent elastomeric material that holds its shape during the UV curing process. The gasket does not change shape or deform when exposed to the heat generated during the curing reaction of the UV light on the polymerizable lens forming material. The gasket has a first, lower annularly extending lip or edge which extends circumferentially around

an inner surface of the gasket. The gasket also has a second, upper annularly extending lip or edge having a predetermined height. The upper edge extends circumferentially around the inner surface of the gasket. The height or thickness of the upper edge will vary from gasket to gasket, depending on the thickness of lens which is to be cast. The back mold member is positioned in the gasket such that a lower surface of the back mold member rests on the upper edge. When the front mold member is placed in abutting relationship to the lower edge, the gasket seals around the entire circumference of the front mold member. The upper edge of the gasket holds the back mold member in a spaced apart relationship from the front mold member. The back mold member and the front mold member define a space or casting cavity which receives the UV polymerizable lens forming material.

In a preferred embodiment, a lens casting assembly which comprises the front mold, the gasket, and the back mold, is held in a steady position so that the polymerizable lens forming material can be dispensed in the space defined between the front mold member and the back mold member. In a preferred embodiment, during dispensing of the lens forming material in the lens casting assembly, the gasket is flexed or pulled away slightly from the edge of the back mold member and the polymerizable lens forming material is dispensed into the casting cavity. The gasket is preferably sufficiently flexible to allow the polymerizable lens forming material to be dispensed while keeping the front mold in a sealing relationship with the lower annular edge of the gasket. The polymerizable lens forming material does not leak from the casting cavity due to the presence of the lower, self sealing edge of the gasket.

According to the present invention, there is no need for adding heat or thermal energy to the casting process. Further, there is no need to cool or remove thermal energy from the polymerizable lens forming material after the lens has been cured with UV light.

The present invention also includes a polymerizable lens forming material which comprises a rapidly curing a mixture of a resin material which cures upon exposure to ultraviolet light and at least one photoinitiator which absorbs both ultraviolet light and visible light. The present invention still further includes a photochromatic lens forming material which comprises a mixture of the polymerizable lens forming material at lest one photochromatic dye. Suitable photochromatic dyes remain stable when exposed to the ultraviolet light which cures the resin material.

The present invention also relates to a photochromatic coating composition and its use as a coating for various substrates. The photochromatic coating compositions comprise at least one photochemical substance which has a induced reversible color change when exposed to different wavelengths of light, such as sunlight or ultraviolet radiation. When the light source is removed, the photochemical substance reverts back to the original color. The cycle times for color change differ depending on the medium in which the photochemical substance is dispensed.

The photochemical substances is mixed with at least one suitable medium and then is coated onto the substrate. The substrates can include such diverse articles as optical lenses, frames, and fingernails, both natural and artificial.

Description of the Figures

Fig. 1 is a perspective view, partially broken away, of an apparatus for producing a plastic lens.

Fig. 2 is another perspective view of an apparatus for producing a plastic lens.

Fig. 3 is a perspective view of a lens casting mold component of the apparatus of the present invention.

Fig. 4 is a cross-sectional view of a lens casting mold component for use in the apparatus of the present invention.

Fig. 5 is a perspective view of a resin dispensing apparatus and the lens casting mold component.

Fig. 6 is a cross-sectional view of a lens casting mold component being filled with a UV light curing polymer material while being held in the resin dispensing apparatus.

Description of the Preferred Embodiment

Fig. 1 generally shows an apparatus 10 of the present invention which includes a curing chamber 12 and a UV lamp housing 14. The curing chamber 12 generally has a door 16 which can have a viewing window 18. The lamp housing 14 contains a UV lamp 20 which produces light in both the UV and visible light spectra. In a preferred embodiment, the lamp housing 14 can have a plurality of shutters 22. However, it is also within the contemplated scope of the present invention that the lamp housing 14 can have a shutterless system using a rapid start ballast to produce ultraviolet and/or visible light exposure to the curing chamber 12 without the need for shutters.

As shown in Fig. 2, the curing chamber 12 includes a carousel or rotating table 30 which is operatively connected to a motor (not shown) for turning the rotating table 30. In a preferred embodiment, the turntable makes between about 4 to about 6 resolutions per minute. The curing chamber 12 further includes a diffusion member or plate 36 made of a frosted glass which is removably positioned on the table 30 when the curing chamber 12 is in use.

It is to be understood that the lamp 20 preferably generates ultraviolet light having a wavelength in the range of about 300 nm to about 400 nm which is the preferred wavelength spectrum for curing polymer materials, as will be discussed in detail below. The intensity of

the ultraviolet light is diffused as the light passes through the diffusion plate 36. The diffusion of the light and the rotation of the lens being cured on the turn table 30 provides an overall uniform curing of the polymerizable material.

Fig. 2 shows a mold assembly 40 (which will be explained in detail below) positioned on the rotating table 30. The rotating table 30 rotates the mold assembly 40 about an axis that extends in a perpendicular direction to the plane of the lens being cast. In the operation of the lens making apparatus 10, an on/off power switch 42 is activated and an hour meter 43 is observed to determine whether certain adjustments are needed. A timer switch 44 is turned to an on position. A turn table switch 46 is moved to an on position. The shutters 22 are adjusted by moving a switch 48 from a closed to an open position. The UV light passes through the diffusion plate 36 and contacts the mold assembly 40, thereby allowing the rapidly curing polymerizable resin material to fully cure. The polymerizable material cures in a rapid time of less than about two minutes.

Those skilled in the art of lens making realize that lens forming materials take a long time to cure and have a tendency to shrink during cure. Accordingly, one aspect of the present invention is to provide an improved polymerizable material for lens making which does not have the drawbacks of the widely used CR39 type polymers.

According to another aspect of the present invention, the polymerizable lens forming material comprises a mixture of at least one monomer resin and at least one photoinitiator. In preferred embodiments the monomer material can be a CR424 monomer which is made by PPG Industries, Optical Products Group, Pittsburgh, Pennsylvania. The CR424 monomer properties are: 78% transmission through 50 mm; yellowness index of less than about 10, through about 50 mm; refractive index of 1.522, viscosity (centistokes at 25°C) of 150 cps; density (g/cc at

25°C) of 1.111; percent haze less than about 1%; storage stability (uninitiated at 20-25°C-68-77°F) of at least five months. The polymer properties are a transmission of about 90.97%; yellowness index (11.8mm thickness) 0.63; refractive index 1.554; Abbe Number 38; density (g/cc at 25°C) 1.205; Barcol Hardness (0-15 seconds) 13-6; Bayer Abrasion Resistance (comparison to the CR39 monomer) 0.75; polymerization shrinkage 8.20%; heat distortion temperature (°C at 10 mil deflection) 51; and total heat deflection at 130°C in mils (0.001 inches) 85. In another preferred embodiment, a monomer material known as CR427, also made by the PPG Industries is useful to produce lenses which are harder and more scratch resistant than lenses made using the CR424 monomer material.

The monomer is preferably mixed with a suitable non-peroxide based photoinitiator. The preferred mixture comprises a photoinitiator which cures uniformly throughout the polymerizable mixture, rather than a photoinitiator which is a surface cure initiator only that migrates in the mixture. The photoinitiator preferably exhibits an ultraviolet absorption spectrum over about 350-400nm range and also absorbs light in the visible spectrum. In a preferred embodiment, the photoinitiator can comprise an Irgacure® 1700 material which produced by the CIBA Geigy Corporation and comprises about 25% bis (2,6-dimethoxybenzoyl) - 2,4-,4-trimethylpentyl phosphine oxide (molecular weight, g/mole: 490.0) ($C_{26}H_{35}O_7P$) and about 25% 2-hydroxy-2-methyl-1-phenyl-propan-1-one (molecular weight, g/mole: 164.2)($C_{10}H_{12}O_2$). The Irgacure® 1700 material, when used with the polymerizable resin material, provides a very rapid rate of polymerization of less than about two minutes, and in certain embodiments, about one minute. The Irgacure® 1700 photoinitiator mixes readily with the CR424 and/or CR427 monomer and is stable over a five to six month period of time. It is to be understood that in certain embodiments, other photochemical initiators, including

derivatives of acetophenone and benzophenone, including for example a Lucirintpo® diphenyl (2,4,6-trimethyl benzoyl), phosphine oxide material which is a photoinitiator made by the BASF Corporation can be used in the present invention.

The suitable monomer material has a very low shrinkage as compared to the CR39 material which allows the lens being cast to be completely polymerized and solidified within a period of about one to two minutes. The rotation of the lens on the turntable and the diffusion of the UV light as the light passes through the diffusion plate provides a cast lens with no shadows or other distortions or crazing. The lenses produced according to the method of the present invention have high uniformity and are stable and resistant to stress or fractures.

According to one preferred embodiment, the polymerizable lens forming material composition of the present invention, includes about 80 to about 99.009% CR424 and/or CR427 monomer material and about .001 to about 1.0% of a photoimitator such as Irgacure® 1700 photo initiator. It is to be understood that various other optional ingredients can be included in the lens making composition which do not detract from the features of the lens crafting polymer composition. These and other ingredients can be used by those skilled in the art of lens making.

According to another aspect of the present invention, photochromatic lenses can be made using a mixture of the polymerizable lens forming material described herein and a photochromatic dye which is compatible with the UV curable resin material and the photoinitiator material. According to the present invention, the photochromatic dye is mixed into the polymerizable lens forming material prior to any curing of the lens forming material. The method of the present invention produces many colors of photochromatic lenses including red, green, blue, yellow, brown and gray. Useful photochromatic dyes include Reversacols dyes manufactured by the James Robinson Limited Company and distributed

in the United States by the Keystone Aniline Corporation. The especially useful colors include Oxford Blue, Aqua Green, Sea Green, Berry Red, Flame Red, Rose Red, Plum Red, Palatinate Purple, Storm Purple, Rush Yellow and Corn Yellow.

The Reversacol type photochromatic dyes include naphthopyran type dyes such as the Berry Red, Corn Yellow and Tangerine colors which have a chromene molecule type, while the Sea Green, Plum Red, Aqua Green, Oxford Blue, Claret, Palatinate Purple, and Storm Purple colors have a spirooxazine molecule type.

In certain embodiments, a photochromatic yellow lens can be produced that is beneficial for patients requiring a blue light reduction and increased contrast. Patients with cataracts and patients participating in sports will benefit most from this tint.

A yellow lens can comprise a Reversacol Corn Yellow dye mixed in the polymerizable lens forming material in a concentration of about .05 to .2 grams per 1000ml of lens forming material, depending on the degree of yellow required in the final activated lens.

A gray lens can comprise a mixture of Reversacol Berry Red, Sea Green, and Corn Yellow dyes in a concentration of about .01 to .2 grams per 1000ml activated monomer.

A brown lens can comprise the gray lens formulation with an increase in Corn Yellow dye in the gray mixture.

A blue lens can comprise a mixture of Reversacol Palatine Purple, Oxford Blue and/or Storm Purple dyes in a concentration of about .01 to .2 grams of dye in 1000ml activated monomer. This lens is a cosmetic deep blue photochromatic lens.

A red lens can comprise a mixture of Reversacol Berry Red and/or Plum Red in a concentration of about .01 to .2 grams of dye in 1000ml activated monomer. This lens is a cosmetic deep red photochromatic lens.

A green lens can comprise a mixture of Reversacol Aqua Green and/or Sea Green dyes in a concentration of about .01 to .2 grams of dye in 1000ml activated monomer. This lens is a cosmetic green photochromatic lens.

This method of photochromatic lens production allows the manufacturer to cast lenses directly to a patient's prescription, in a chosen color, while the patient waits, thus reducing lens inventory. Also, the photochromatic lenses do not have to be precast and sent to another manufacturer for photochromatic dye addition. It is also within the contemplated scope of the present invention that multiple color photochromatic lenses can be cast by filling the mold with layers of different colors of the photochromatic dye lens forming material.

Referring now to Fig. 3, the mold assembly 40 is shown in an exploded perspective view. The mold assembly 40 includes a back or top mold 50 preferably made of a glass material. The back mold 50 has an upper surface 52 and a lower surface 54. The back mold 50 has an edge 56 extending around the circumference of the back mold 50. The lower surface 54 of the back mold 50 has an optimum curvature which provides at least part of the required correction for the lens to be molded.

The lens assembly 40 further comprises a gasket 60 made of a flexible or elastomeric plastic material which is compatible with the polymerizable resin material. In the preferred embodiments, the gasket is made of a material which is ultraviolet light transparent. Suitable flexible materials which do not react with the lens casting polymers include polyvinyl chloride, soft polymethyl methacrylate and polyethylene, among others. It is to be understood that various flexible plastic materials which allow the transparency of ultraviolet light can be used with the present invention.

The gasket 60 defines an upper inner edge or lip 62 which extends in a radially inward direction circumferentially around an inner surface 64

of the gasket 60. The upper edge 62 has an annularly extending face or circumferential surface 66. The surface 66 has a desired predetermined height or depth. It is to be understood that various gaskets can have differing heights of the surface 66 so that different thicknesses of lens can be cast.

The gasket 60 defines a lower edge or lip 70 which extends in a radially inward direction around the inner surface 64 of the gasket 60. The lower edge 70 has an upper surface 72 which is in a spaced apart relationship to the upper edge 66, and a lower surface 74 which is in a spaced apart relationship to a bottom portion 76 of the gasket 60.

In various embodiments, the gasket 60 also has a tab 80 integrally molded with an outer surface 82 of the gasket 60. The tab 80 has a retaining plug or member 84 which secures the tab to a dispensing stand 100 when a polymerizable lens forming material 130 (either with or without at least one photochromatic dye) is being injected between the back mold member 50 and a front mold member 90, as will be explained in detail below.

The lens assembly 40 further comprises a front or bottom mold 90 which preferably is made of a metal material. The front mold 90 has an upper or inner surface 92 and a lower surface 94. The front mold 90 has a flat beveled rim or edge 96. In a preferred embodiment the front mold 90 is made of a nickel material which is electrocoated with a diamond like carbon coating 97. In certain preferred embodiments, when bifocal lens are to be casted, the front mold 90 can have a bifocal segment 98 on the inner surface 92.

When assembled in the gasket 60, the front mold member 90 and the back mold 50 define a cavity 78 which receives the polymerizable resin material 130. It is understood by those skilled in the art that the dimensions of the cavity 78 determine the shape of the lens to be cast.

Referring now to Figs. 4 and 6, the mold assembly 40 is shown ready to accept the resin material 130. The front mold 90 is positioned in the gasket 60. The beveled edge 96 of the front mold 90 is positioned on the upper surface 72 of the lower lip or edge 70. The flat beveled surface 96 of the front mold 90 is engaged in the space between the upper edge 62 and the lower edge 70. The lower edge 70 holds the front mold 90 in a secure position in the gasket 60.

The back mold 50 is placed in the gasket 60. The lower surface 54 of the top mold 50 is adjacent an upper surface 68 of the upper edge 62. The circumferential surface 56 of the back mold 50 is secured against the inner surface 64 of the gasket 60.

Referring to Fig. 5 now, the dispensing stand 100 is generally shown. The dispensing stand 100 has a base 102 and a support arm 104 in a spaced apart relationship to the base 102. In a preferred embodiment the base 102 of the dispensing stand 100 defines a well 106 for receiving any excess resin material. The supporting arm 104 has a first or distal end 110 in a spaced apart relationship to the base 102. The distal end 110 defines an opening 112 for slideably receiving the tab 80 of the gasket 60.

A dispensing pen 120 is used to dispense a predetermined amount of the polymerizable resin material 130 into the mold assembly 40. The dispensing pen 120 is attached by a tube 122 to a pressurized container 124 in a manner which is well known in the art. The dispensing pen 120 has a tip 126 which allows the polymerizable resin material 130 to be accurately dispensed. In the embodiment shown, a handle 128 is retracted or squeezed by the user to dispense a predetermined amount of the polymerizable resin material 130. As shown in Fig. 6, the gasket 60 is stretched or flexed and the tip 126 is placed adjacent the side wall 64 of the gasket 60 in a manner such that the polymerizable resin material 130 flows into the cavity 78 defined between the front mold 90

and the back mold 50. The front mold 90 is held securely in position in the gasket 60 by the lower edge 70 of the gasket 60. The polymerizable resin material 130 flows to the circumferential surface 66 of the upper lip or edge 62 such that the polymerizable resin material 130 substantially completely fills the cavity 78.

After the polymerizable resin material 130 substantially fills the cavity 78, the mold assembly 40 is slideably removed from the opening 112 in the stand 100. It is to be understood that in certain embodiments a dispensing stand is not needed. The dispensing tip 126 can be inserted between the circumferential edge 64 of the gasket 60 and the circumferential edge 56 of the back mold 50 simply by flexing one edge of the gasket 60 in a direction away from back mold 50.

After the mold assembly 40 is filled with the polymerizable resin material 130, the mold assembly 40 is placed in the curing chamber 12 and is cured in a manner as described above.

After the polymerizable resin material 130 is cured, the user removes the gasket 60 and applies pressure to at least a portion of an edge of the cast lens, which allows the lens to be released from the front mold 90 and the back mold 50.

In other embodiments, it is possible to use a precast front or add plate to make polycarbonate lenses or to make lenses with photochromatic, antireflective, or antireflective photochromatic features. It is to be further understood that front molds can be formed such that bifocal or progressive lenses can also be cast by using the method and apparatus of the present invention.

Another aspect of the present invention relates to coating a substrate with a photochromatic coating material to produce an article that changes color when exposed to different wavelengths of light. It is within the contemplated scope of the present invention that the photochromatic dye compositions discussed above are useful in preparing

the photochromatic coating composition. According to a preferred method, the photochromatic dyes are mixed with a suitable medium and coated onto the substrate.

In one embodiment, the photochromatic dyes are mixed with a suitable medium and coated onto at least one surface of an optical lens material, such as the optical lenses described above. However, it is also within the contemplated scope of the present invention that other types of optical lenses can be coated with the photochromatic composition to produce lenses which change color.

In another embodiment, at least one of the photochromatic dyes is added to a suitable base medium to make a photochromatic fingernail polish. In preferred embodiments, the photochromatic dyes are added at concentrations ranging from about 0.001% to about 0.1%, by weight, to a suitable base medium. Various suitable base media include, but are not limited to cyclomethicone, mineral oil, ethyl acetate, isopropyl alcohol, butyl acetate, propyl acetate, acrylates copolymer, epoxy resin, nitrocellulose, cellulose acetate butyrate, etocrylene benzophenone-1, isostearoyl hydrolyzed keratin, panthenol, n-butyl alcohol, polyester resin, formaldehyde resin, and the like. The coating composition can be cured by exposure to ultraviolet radiation for a rapid cure, or by exposure to air.

Having described the invention above, various changes from the specific materials, procedures and apparatus will occur to those skilled in the art. It is intended that all such variations are within the scope and spirit of the appended claims.

I CLAIM:

1. A method for making a plastic lens comprising

providing a front mold having a reflective, non-ultraviolet (UV) absorptive inner surface;

providing a back mold which is UV light transmissive;

disposing the front mold and the back mold in a UV light transparent gasket, the gasket defining a lower inner edge for removably sealing the front mold to the gasket, the gasket further defining an upper inner edge for holding the back mold in a spaced apart relationship to the lower inner edge, the space between the upper and lower inner edges defining a lens forming cavity when the front mold and the back mold are positioned in the gasket;

the lower inner edge of the gasket extending in a radially inward direction around an inner surface of the gasket, the lower inner edge having an upper surface which is in a spaced apart relationship to the upper inner edge wherein the front mold is removably sealed within and is held in position in the gasket by the lower inner edge;

dispensing a predetermined quantity of a UV curable lens forming resin material in the lens forming cavity, the resin material comprising at least one a polymerizable material and at least one photoinitiator, which cure when exposed to UV light; and,

exposing the dispensed resin material in the lens forming cavity to a source of UV light for a predetermined length of time at a predetermined intensity to cure the resin material without the need for either cooling or the addition of heat to the resin material.

2. The method of claim 1, in which the UV light passes through a diffusion member before the UV light passes through and cures the lens forming resin material.

3. The method of claim 2, in which the resin material in the lens forming cavity is rotated about an axis extending perpendicular to the plane of the lens during the curing of the lens forming resin material.

4. The method of claim 1, in which the front mold comprises a nickel material coated with a hard carbon surface.

5. The method of claim 1, in which the back mold comprises a transparent glass material.

6. The method of claim 1, in which the lens forming resin material is exposed to UV light for a period of two and a half minutes or less.

7. The method of claim 1, in which the gasket is removed, exposing the edge of the cured lens material and a force is applied at least a portion of an edge of the front and/or back molds to remove the lens from the front and back molds.

8. The method of claim 1, in which the photoinitiator comprises a mixture of bis (2,6-dimethoxybenzoyl)-2,4-,4-trimethylpentyl phosphine oxide and 2-hydroxy-2-methyl-1-phenyl-propan-1-one.

9. The method of claim 1, in which the resin material further comprises at least one photochromatic dye material.

10. A polymerizable resin material comprising: i) a photoinitiator comprising a mixture of bis (2,6-dimethoxybenzoyl)-2,4-,4-trimethylpentyl phosphine oxide and 2-hydroxy-2-methyl-1-phenyl-propan-1-one, and ii) a polymer material which, when exposed to UV light for a period of two and a half minutes or less, cures without need for either cooling or the addition of heat to the polymerizable resin material.

11. The polymerizable resin material of claim 10, wherein the polymer material comprises a monomer.

12. A polymerizable resin material comprising i) at least one photoinitiator comprising a mixture of bis(2,6-dimethoxybenzoyl)-2,4-,4-trimethylpentyl phosphine oxide and 2-hydroxy-2-methyl-1-phenyl-propan-1-one, ii) at least one polymer material which, when exposed to UV light for a period of two and a half minutes or less, cures without need for either cooling or the addition of heat to the polymerizable resin material, and iii) at least one photochromatic dye.

13. An apparatus for making a plastic lens comprising

a front mold having a reflective, non UV absorptive inner surface;

a back mold which is UV light transmissive;

a UV light transparent gasket, the gasket having a lower inner edge for securing the front mold to the gasket and an upper inner edge in a spaced apart relationship to the lower inner edge for holding the back mold in a spaced apart relationship to the front mold, the spaced apart front mold and the back mold defining a lens forming cavity;

the lower inner edge of the gasket extending in a radially inward direction around an inner surface of the gasket, the lower inner

edge having an upper surface which is in a spaced apart relationship to the upper inner edge wherein the front mold is removably sealed within and is held in position in the gasket by the lower inner edge;

a means for dispensing a predetermined quantity of a UV curable lens forming resin material in the cavity, the resin material comprising a mixture of a polymerizable material and a photoinitiator which mixture cures when exposed to UV light in less than about two and one half minutes; and,

a means for exposing the dispensed resin in the lens forming cavity to a source of UV light for a predetermined length of time at a predetermined intensity to cure the resin material without need for either cooling or the addition of heat to the resin material.

14. The apparatus of claim 13, wherein the UV light passes through a diffusion member before the UV light passes through and cures the lens forming resin material.

15. The apparatus of claim 14, wherein a turn table rotates the resin material in the lens forming cavity about an axis extending perpendicular to the plane of the lens during the curing of the lens forming resin material.

16. The apparatus of claim 13, wherein which the front mold comprises a nickel material coated with a hard carbon surface.

17. The apparatus of claim 13, wherein which the back mold comprises a transparent glass material.

18. A gasket for use in making a plastic lens comprising a UV light transparent gasket having (i) a lower inner edge , the lower inner

edge extending in a radially inward direction around an inner surface of the gasket, the lower inner edge having an upper surface which is in a spaced apart relationship to the upper inner edge, the lower inner edge removably sealing a front mold to the gasket, the lower inner edge holding the front mold in the gasket; and

(ii) an upper inner edge extending in a radially inward direction circumferentially around the inner surface, the upper inner edge having an annularly extending surface, the upper inner edge holding a back mold in a spaced apart relationship to the lower inner edge, the upper and lower inner edges defining a substantially self-sealing lens forming cavity when the front mold and the back mold are removably secured in the gasket.

19. A front mold for use in making a plastic lens, the front mold comprising a nickel material coated with a hard carbon surface.

20. A method for coating a substrate comprising coating the substrate in which UV light passes through a diffusion member before the UV light passes through and cures the photochromatic coated substrate with at least one photochromatic composition and curing the photochromatic coated substrate by exposing the coated substrate to UV light without need for either cooling or the addition of heat to the coated substrate.

21. The method of claim 20, wherein the coated substrate is exposed to a source of UV light for a predetermined length of time at a predetermined intensity to cure the coating material.

22. CANCELLED

23. The method of claim 20, in which the substrate comprises an optical lens.

24. The method of claim 20, in which the substrate comprises a frame for optical lenses.

25. The method of claim 20, in which the substrate comprises fingernails.

26. A coating material for a substrate comprising at least one photochromatic dye and at least one base medium which is cured by exposure to UV light or air without need for either cooling or the addition of heat to the coating material.

27. The coating composition of claim 26, wherein the base medium comprises at least one of the following: cyclomethicone, mineral oil, ethyl acetate, isopropyl alcohol, butyl acetate, propyl acetate, acrylates copolymer, epoxy resin, nitrocellulose, cellulose acetate butyrate, etocrylene benzophenone-1, isostearoyl hydrolyzed keratin, panthenol, n-butyl alcohol, polyester resin, formaldehyde resin, and the like.

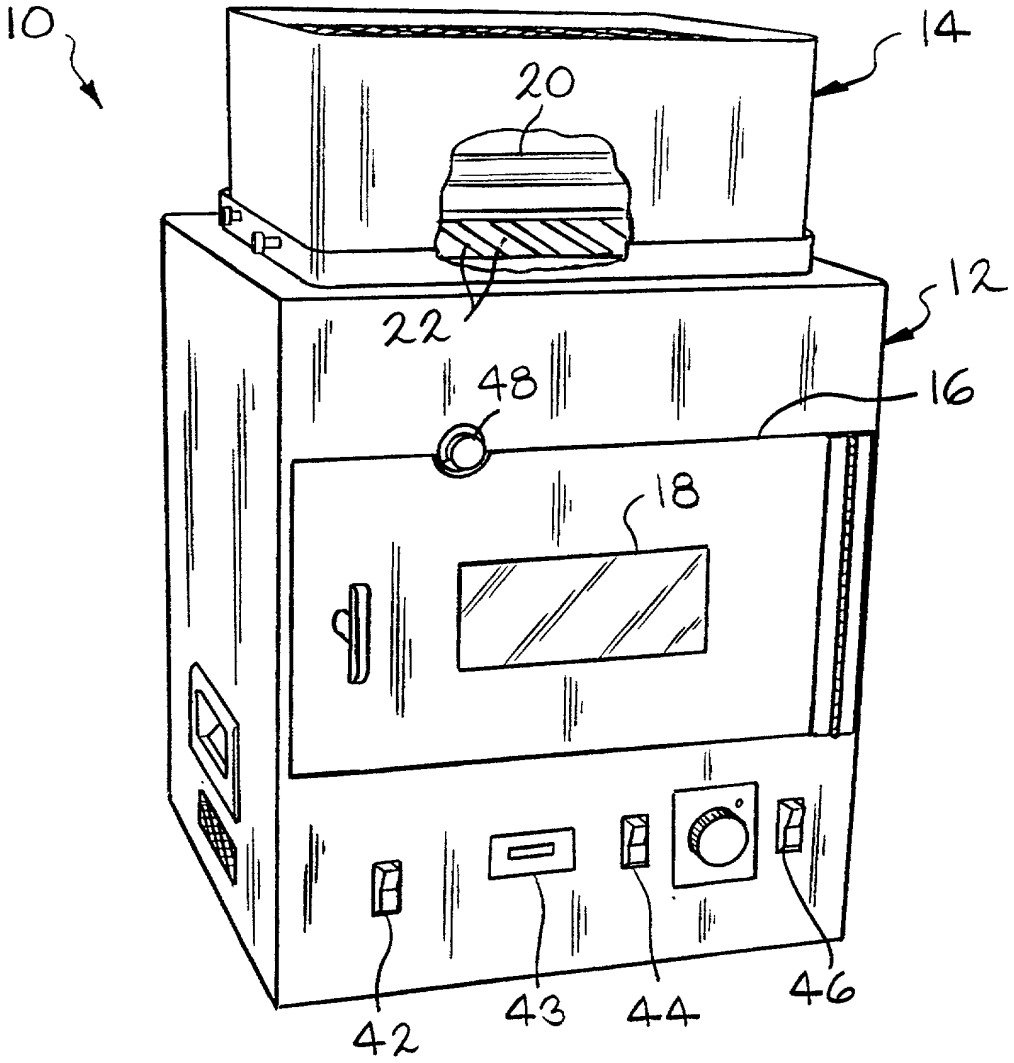

FIG. 1

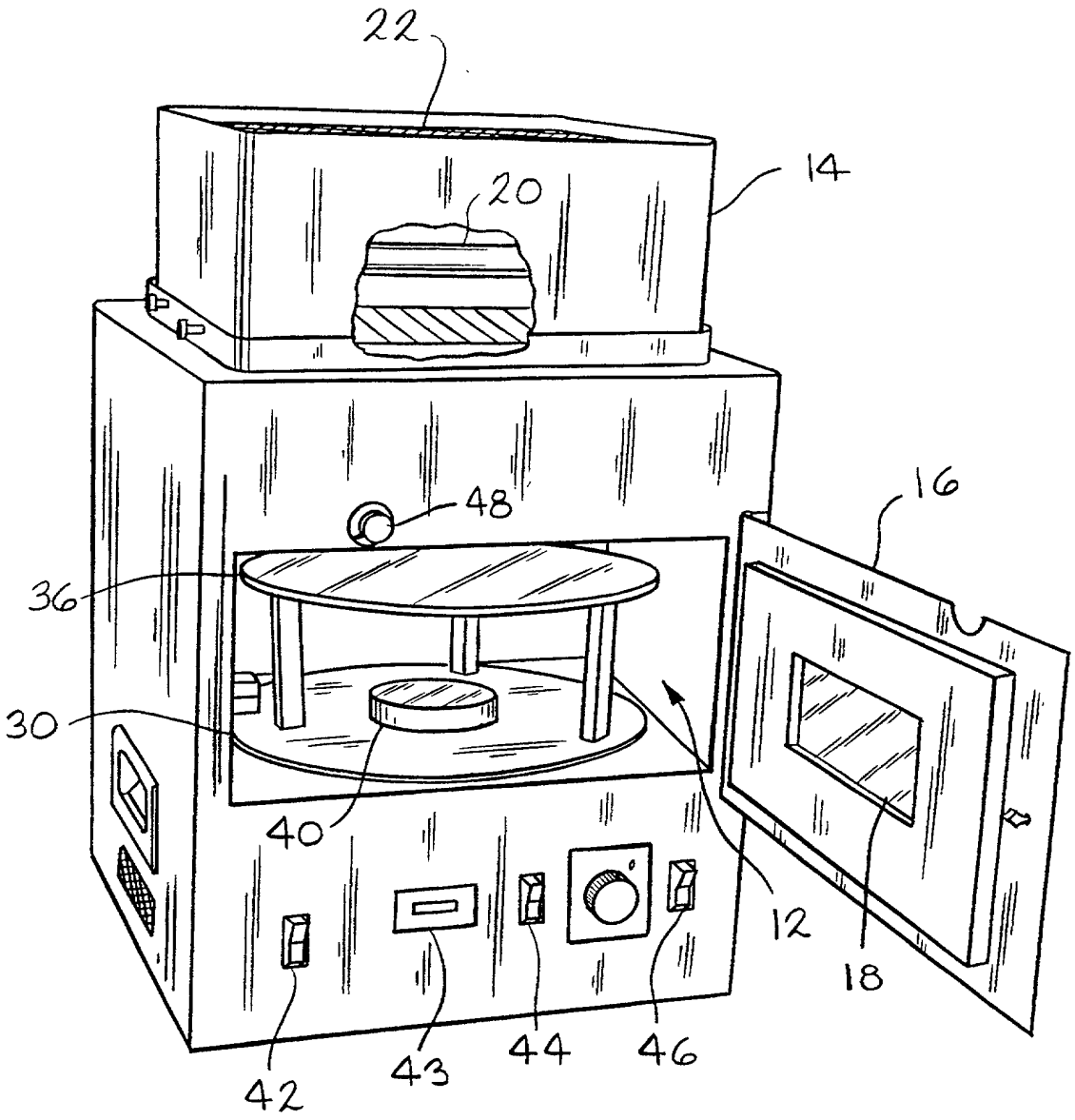

FIG. 2

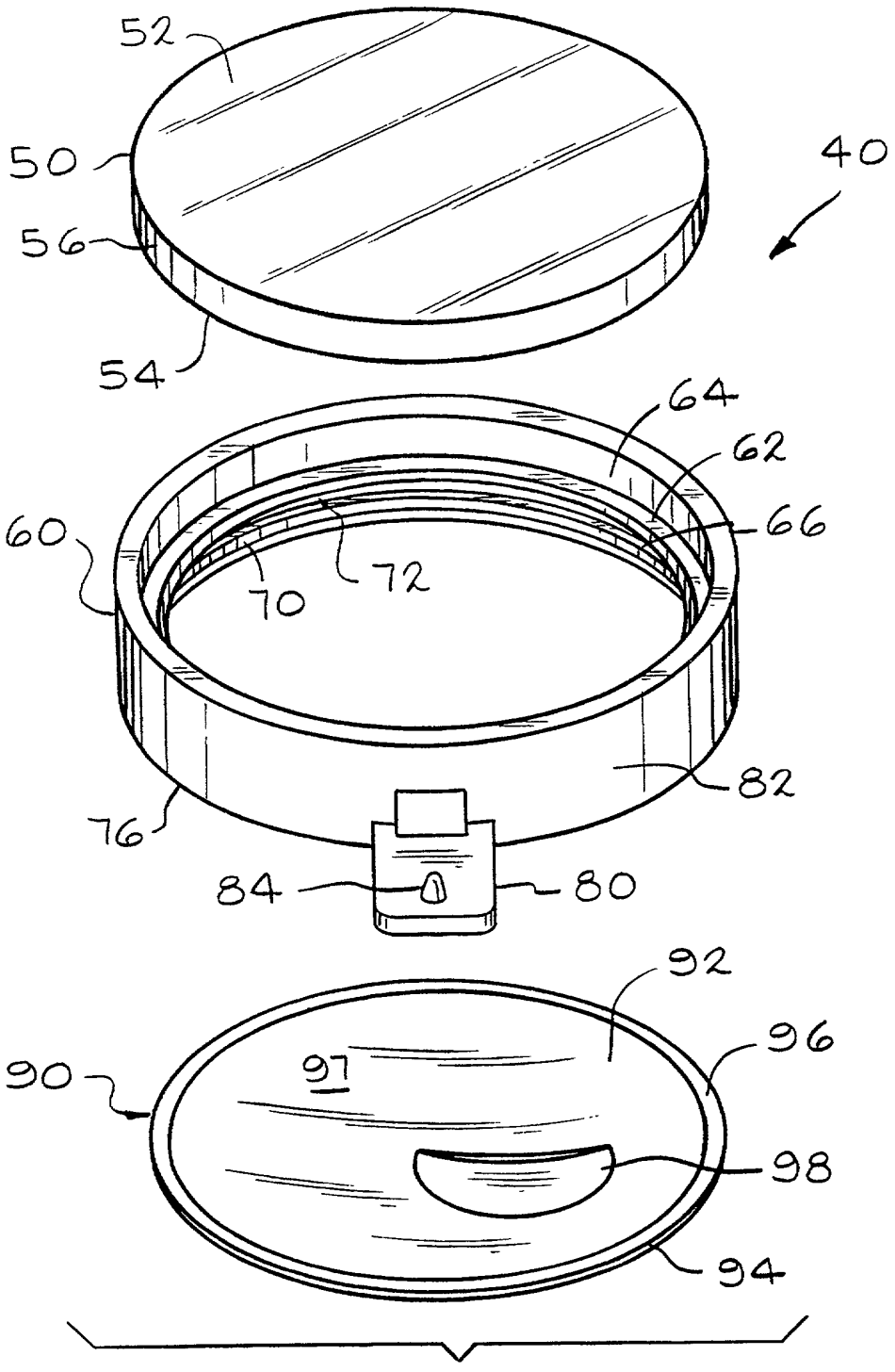

FIG. 3

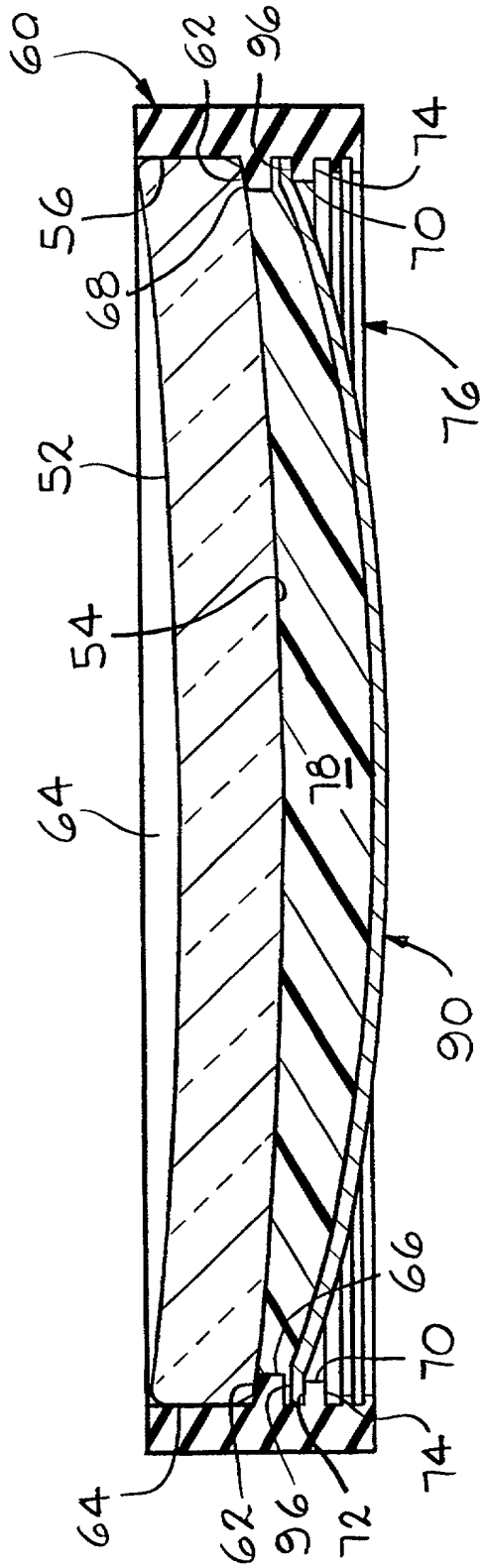

FIG. 4

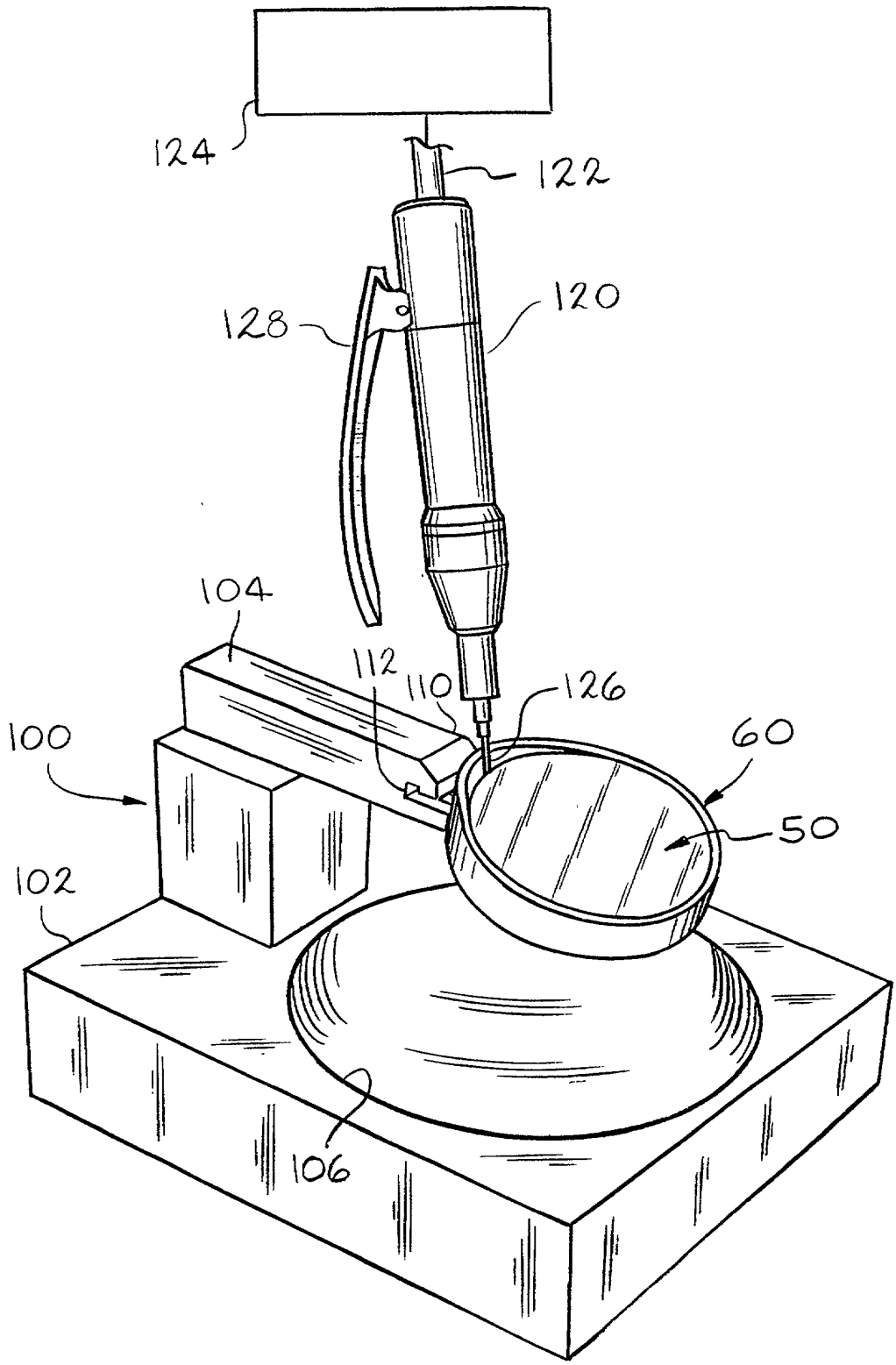

FIG. 5

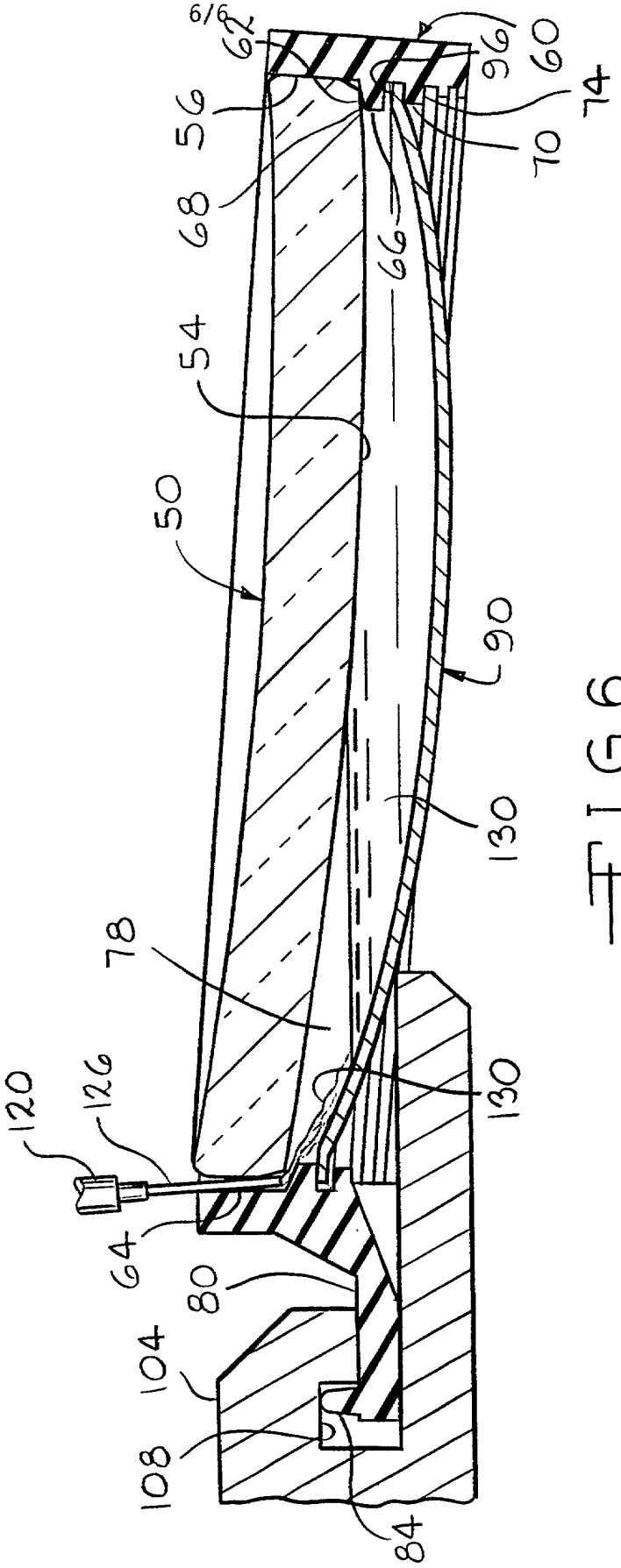

FIG.6

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☐ Declaration Submitted with Initial Filing **OR** ☒ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	00265
First Named Inventor	Duane L. Wires
COMPLETE IF KNOWN	
Application Number	09 / 720,754
Filing Date	December 28, 2000
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

METHOD AND COMPOSITIONS FOR MANUFACTURING COATED PHOTOCHROMATIC ARTICLES

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 12/28/2000 as United States Application Number or PCT International Application Number 09/720,754 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	Certified Copy Attached? NO
PCT/US99/16650	US	07/22/1999	☐	☐	☒
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☒ Customer Number 20879 → *Place Customer Number Bar Code Label here*

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Name	Registration Number	Name	Registration Number

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Address					
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Country		Telephone		Fax	

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
Duane L.	Wires

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Post Office Address							
City	Findlay	State	Ohio	ZIP	45840	Country	USA

☐ Additional inventors are being named on the ____supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

1-00